REMARKS

As a preliminary matter, Applicant wishes to thank Examiner Vo and Group Director Hille for granting Applicant's request for reconsideration and withdrawing the finality of the Office Action dated March 8, 2000.

In addition to responding to the Office Action dated August 29, 2000, Applicant is submitting herewith the declarations of Dr. Mark R. Allen, PhD. and David R. Allen under 37 C.F.R. §1.132. Dr. Allen's declaration addresses the merits of the invention and certifies the experimental results provided herein. David R. Allen's declaration addresses commercial success and immediate misappropriation of the invention by others. Applicant requests that the Examiner enter these declarations into the record in the instant application prior to examining the claims on the merits.

I. Claim Status

Claims 1-9 and 11-28 are now pending in the application. Claim 1 is the only independent claim. Claims 2 through 28 depend from claim 1 either directly or via another dependent claim. Claim 1 has been amended to more particularly point out and distinctly claim Applicant's invention. The specification has been amended to correct typographical errors and for readability. The amendments are fully supported by the specification as originally submitted. No new matter has been added. Applicant hereby requests further examination and reconsideration of the application, in view of the foregoing remarks.

II. 35 U.S.C. §102(e) and 103(a) Rejections based on Yamuro

Claims 1-3, 9, 14-16, 25 and 26 were rejected under 35 USC §102(e) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Yamuro.

A. Introduction

We note at the outset that throughout the prosecution of this case, there has been a fundamental disconnect between the Examiner's interpretation of Yamuro and Applicant's interpretation. Applicant appreciates the detailed comments provided as support for the

rejections based on Yamuro (U.S. Patent No. 5,941,626) in the latest Office action. Those helpful comments significantly assisted the Applicant in discovering the source of this disconnect and properly amending claim 1 to distinguish Yamuro from Applicant's invention.

The point of contention throughout the prosecution of this case has been whether Yamuro requires a resistor in the LED circuit to be operatively stable. The Examiner finds the resistor in Yamuro to be *optional,* thereby rendering Applicant's invention anticipated by, or in the alternative, obvious in view of Yamuro. In particular, the Examiner states in paragraph 2 of the Office Action that "the claimed invention has been viewed as an obvious variation in design choice over Yamuro in view of the fact that line 37, column 3, in this teaching clearly lays out a desire for doing away with the resistor connection if needed."

To the contrary, Applicant has repeatedly argued that Yamuro *requires* the use of a resistor. More specifically, Applicant's Response to Final Office Action dated June 8, 2000 sets forth in great detail the basis for this position, citing the same section of Yamuro, as well as Figures 1A and 1B, and column 3, lines 23-30 and 34-45. However, the Examiner states in paragraph 7 of the most recent Office Action that these arguments have not been found to be persuasive.

To supplement those arguments, Applicant submits herein and herewith: (1) conclusive experimental evidence proving beyond doubt that the Yamuro reference could not have contemplated a circuit without the resistor in the manner suggested by the Examiner; (2) an explanation of the theory behind Applicant's invention setting forth the critical distinctions over Yamuro and the prior art; (3) evidence of commercial success and copying of Applicant's invention that support a finding of non-obviousness; and (4) affidavits and letters from leaders in the LED industry supporting the non-obviousness of Applicant's invention.

Applicant respectfully requests reconsideration of the arguments presented in Applicant's Response to Final Office Action dated June 8, 2000, particularly in view of the amendments to Claim 1, the experimental evidence and supplemental remarks submitted herein.

B. Experimental Evidence Reveals that Yamuro Could Not Possibly Teach that a Resistor is Optional

In paragraph 7 of the Office Action, the Examiner takes the position that Yamuro teaches that fifty (50) 2-volt LEDs connected to a 100V AC power source without resistance is "operatively stable" in Japan. Most notably, the Examiner states **"the teaching supported by line 37, column 3 clearly suggests the removal of the resistor(8)", "[I]f one were to construct figure 1B to be used in Japan, a resistor (8) would have been inherently eliminated as clearly pointed out by this teaching"** and **"given the power situation in Japan as it is suggested under line 37, column 3, one could not help but to construct the circuit without the resistor (8)."** For these reasons, the Examiner finds that Yamuro anticipates the claimed invention.

Applicant appreciates the Examiner's clear and concise explanation for rejecting Applicant's claims in view of Yamuro. However, Applicant respectfully submits, and will show through experimental evidence, that circuits built according to the Examiner's reading of Yamuro, using LEDs specified according to Yamuro, fail *consistently*. Thus, the caveat in Yamuro at column 3, line 37-39 that "the resistance 8 apparently seems unnecessary. However, it is proved from experience that the apparatus is stable in function by providing resistance 8," *must be* read to require a resistor in the LED circuit.

Applicant has constructed three LED circuits, according to the specifications listed in column 3, line 31-43 of Yamuro, to demonstrate that the Yamuro reference could not be read to suggest the removal of the resistor.[1] Applicant will show that removing the resistor causes the circuit taught by Yamuro to fail. The experiments were videotaped to show the circuit failures. A copy of the video tape is being submitted as Exhibit H to the Declaration of Dr. Mark R. Allen (hereinafter "**Dr. Mark R. Allen Decl.**"). Since the Examiner reads Yamuro to suggest that the resistor is optional, the circuit configurations that omit the resistor will be referred to as the "Examiner Option" and the circuits including a resistor will be referred to as the "Yamuro Circuit" or "Yamuro Design".

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[1]A fourth LED circuit was constructed using 2.2VDC LEDs. This circuit ("case 4") will be explained in greater detail below.

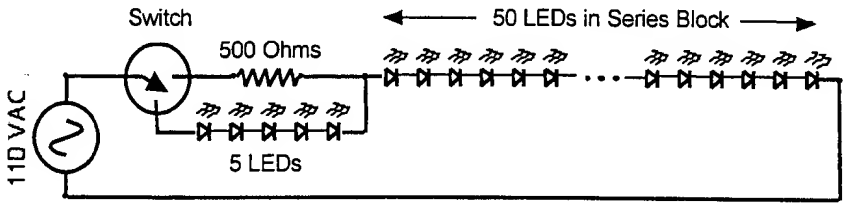
Each circuit was constructed using 2-volt DC LEDs, as specified by Yamuro at column 3, line 31. It is well known in the industry that LED voltage specifications are calculated under DC operating conditions. **Dr. Mark R. Allen Decl. ¶ 13-18.** Thus, to avoid confusion with other discussions later in this Response, we have labeled the LEDs disclosed by Yamuro, as well as those used in the experiments as "2-volt DC" LEDs. The specific LED's used were manufactured by Ledtech, Inc. and bear part number LT1833(4)-81-M1. The specification sheets for these LED's show that they produce a 20 mA nominal DC current. **Dr. Mark R. Allen Decl. ¶ 19, Ex. I.**

Each light string circuit will be referred to as a separate "case". Since Applicant does not have access to a 100VAC source as used in Yamuro, the circuit of cases 1 and 3 assume an AC source voltage of 110VAC, and the circuit of cases 2 and 4 assume an AC source voltage of 120VAC. Typical U.S. household source voltage varies between 110VAC and 120VAC. Thus, experiments were conducted assuming both conditions to ensure the validity of the conclusions drawn from the experiments. To compensate for using source voltages that are 10 VAC and 20VAC above the 100VAC called for by Yamuro, five (5) 2-volt DC LEDs were added to cases 1 and 3, and ten (10) 2-volt DC LEDs were added to case 2. To demonstrate both the Examiner's Option (resistor optional) and Yamuro's Design (resistor required), the circuit in cases 1 and 2 is connected through a switch to either a resistor or a number of LEDs. In one position, the resistor completes the circuit according to Applicant's reading of Yamuro (Yamuro Design). In a second position, LED's are substituted for the resistor, as suggested by the Examiner (Examiner's Option). **Dr. Mark R. Allen Decl. ¶ 20-21.**

The value of the resistor in all cases is calculated according to one of the examples provided in Yamuro at column 3, lines 40-43, which states "50 or less LED lamps **4**, for example 45 or 40 LED lamps, can be connected to the light emitting unit **6**. In this case, the resistance value corresponding to the potential difference from the power source **9** is set as the resistance **8**." Applicant selected Yamuro's 45 LED example for cases 1 and 2, then added five (5) 2-volt DC LEDs to the circuit of case 1 and ten (10) 2-volt DC LEDs to the circuit of case two, to equate the 100VAC source voltage in Japan to the assumed 110VAC and 120VAC source voltages in the U.S., respectively. **Dr. Mark R. Allen Decl. ¶ 22.**

1. Experiment Case #1

For case 1, fifty (50) 2-volt DC LEDs were used, which accounts for 100VAC of the assumed 110VAC source, leaving 10VAC to be compensated by either (1) a resistor when the switch is in the first position, or (2) a number of LEDs when the switch is in the second position. In the first position, a resistor value of 500 Ω was calculated by dividing 10VAC by the 20 mA specified nominal current produced by the LEDs. In the second position, the number of LEDs was calculated by dividing 10VAC by 2-volts (the specified LED voltage) yielding five (5) LEDs. The circuit of case 1 is schematically represented as follows:



Case 1: 110 VAC

The experiment of case 1 was conducted by placing the switch in the first position, then plugging the circuit into a household receptacle.[2] This configuration mirrors the Yamuro Design. The circuit was stable and the resistor became quite hot. Applicant agrees that Yamuro, as well as a number of other prior art references made of record in this case, teach this circuit (i.e. Hewlett Packard's Operational Considerations for LED Lamps and Display Devices notes that a resistor must be used to maintain circuit stability). **Dr. Mark R. Allen Decl. ¶ 24, Ex. J.**

The switch was then moved from the first position to the second position, replacing the resistor with an equivalent number of LEDs. This circuit represents the Examiner's Option. This circuit considers the Examiner's statement that Yamuro "clearly suggests the removal of the resistor **8**". It is an example of the circuit that the Examiner contends is "operatively stable" in paragraph 7 of the Office Action (except of course for the five (5) LEDs added to Applicant's experiment to account for the difference in source voltage). When the switch was moved to the

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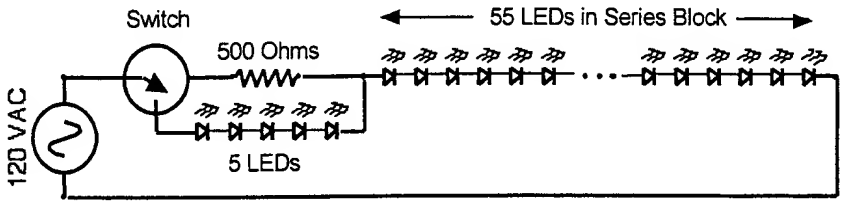
[2]At this time, Applicant urges the Examiner to view the video submitted as Exhibit H to Dr. Mark R. Allen's Declaration. The inventor, Dr. Allen, explains the circuits of case 1 through case 4, performs the experiments, and briefly summarizes the results.

second position, the LEDs immediately dimmed, indicating that the circuit was being stressed. The LEDs then quickly began to fail until the entire LED string failed; proving that the Yamuro circuit without the resistor is inoperable. **Dr. Mark R. Allen Decl. ¶ 23-25.**

2. Experiment Case #2

For case 2, fifty-five (55) two (2) volt DC LEDs were used, which accounts for 110VAC of the assumed 120VAC source, leaving 10VAC to be compensated by either (1) the resistor when the switch is in the first position, or (2) a number of LEDs when the switch is in the second position. Similar to calculations performed for case 1, the value of the resistor connected to one side of the switch was 500 Ω and five (5) LEDs were connected to the other side of the switch to account for the 10VAC. The circuit of case 2 is schematically represented as follows:



Case 2: 120 VAC

The experiment of case 2 was conducted in the same fashion as case 1 with nearly identical results. With the switch in the first position, the circuit was stable and the resistor was very hot. With the switch in the second position, the lights immediately dimmed, indicating that the circuit was being stressed; then the LEDs slowly began to fail until the remaining LEDs all failed virtually simultaneously. The only difference between case 1 and 2 was that the circuit of case 2 took slightly longer to fail when the resistor was removed, but the circuit was nonetheless highly unstable; proving that the Yamuro circuit without the resistor is inoperable. **Dr. Mark R. Allen Decl. ¶ 26-28.**

3. Experiment Case #3

The circuit of case 3 was similar to case 2, however the switch and additional LEDs were omitted from the circuit. Fifty-five (55) 2-volt DC LEDs were connected in series to a 500 Ω resistor. Assuming an AC source voltage of 110 VAC, the circuit was stable and performed as expected, **due to the resistor**.

The resistor was then physically removed from the circuit to test the Examiner's assertion in paragraph 7 of the Office Action that "the teaching supported by line 37, column 3 clearly suggests the removal of the resistor(8)". The circuit, when connected to the AC source, failed immediately; proving that the Yamuro circuit without the resistor is inoperable. In fact, in the video demonstration of this particular experiment, one can hear the LEDs "pop" when the circuit is connected to the AC source. **Dr. Mark R. Allen Decl. ¶ 29-31.**

4. Experiment Case #4

The circuit of case 4 was identical to the circuit of case 3, except 2.2-volt DC LEDs were used. Fifty-five (55) 2.2-volt DC LEDs were connected in series to a 500 Ω resistor. This circuit duplicates the example in Yamuro where fifty (50) 2-volt DC LEDs plus a resistor are used at 100VAC. As expected, **due to the presence of the resistor in the circuit**, the circuit was stable. The resistor was then removed from the circuit leaving fifty-five (55) 2.2-volt DC LEDs connected in series to the electrical plug. According to the Examiner's reading of Yamuro (that an LED circuit can be stable without the resistor if sum of the specified LED DC voltage for each LED in the circuit matches the AC source value), this circuit should be stable up to 121VAC (2.2-volts x 55 LEDS). However, the circuit failed almost immediately when connected to the AC source; proving that the Yamuro circuit without the resistor is inoperable. **Dr. Mark R. Allen Decl. ¶ 32-33.**

5. Summary of Experimental Results

A chart summarizing the results of the experiment is provided below:

Case	Voltage	Resistor	LEDs	Description	*Result*
1	110 VAC	500 Ω	50 2-volt DC	Yamuro Design	*Stable, Works*
1	110 VAC	None	55 2-volt DC	Examiner "Option"	*Fails Quickly*
2	120 VAC	500 Ω	55 2-volt DC	Yamuro Design	*Stable, Works*
2	120 VAC	None	60 2-volt DC	Examiner "Option"	*Fails Quickly*
3	110 VAC	500 Ω	55 2-volt DC	Yamuro Design	*Stable, Works*
3	110 VAC	None	55 2-volt DC	Examiner "Option"	*Fails Quickly*
4	120 VAC	500 Ω	55 2.2-volt DC	Yamuro Design	*Stable, Works*
4	120 VAC	None	55 2.2-volt DC	Examiner "Option"	*Fails Quickly*

These experiments demonstrate beyond doubt that any LED circuit that is designed by matching the sum of the DC specified voltages of all of the LEDs in the circuit to the AC source voltage will be unstable and fail. In fact, these experiments were conducted several times using LEDs from different manufacturers that carry the same specifications as those used in the experiments. In every case the results were the same. **Dr. Mark R. Allen Decl. ¶ 34-35.**

Accordingly, the mere substitution of LEDs for a resistor using LED voltage specifications which are always specified under *DC operating conditions* leads to circuit instability and inevitable circuit failure. Thus, Applicant respectfully submits that Yamuro can not be interpreted to "clearly suggest the removal of the resistor **8**", and therefore, Applicant's claimed invention is not anticipated by or rendered obvious in view of Yamuro.

C. The Theory Behind Applicant's Invention that Distinguishes it from the Prior Art

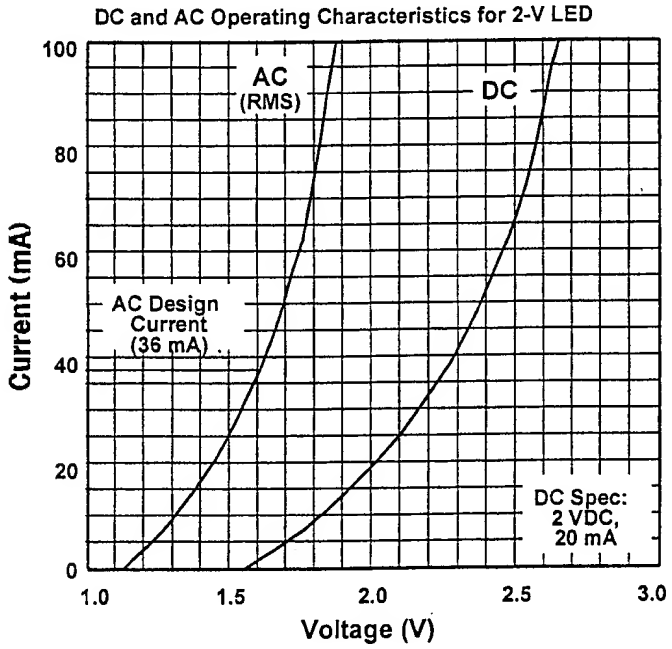
LED circuit theory is based on DC power and the fact that LEDs, being diodes, have a highly nonlinear current-versus-voltage characteristic curve; unlike a resistor whose current-versus-voltage characteristic curve is linear. LEDs are "current driven" devices which fail if the applied DC voltage is too high. As such, the prior art teaches that all LED circuits *require* an auxiliary circuit that limits input current as voltage is increased. Limiting the input current as the voltage increases stabilizes the LED circuit by *linearizing* its current-versus-voltage characteristic curve. The simplest auxiliary circuit is a single impedance element. For DC power, the impedance element is a resistor. **Dr. Mark R. Allen Decl. ¶ 36.**

It is known that LED circuits can be powered by pulsed DC or AC power, in addition to steady-state DC power. However, these different sources of power do not change the fundamental fact that diodes are current-limited devices. Thus, even the most recent prior art teaches that LED circuits *require* at least one impedance element. In the case of AC power, the impedance element may be a resistor, or a reactive element such as a capacitor or inductor. Since the reactance of a capacitor or inductor is constant at a steady frequency (such as 60Hz), the reactive element behaves like a resistor and therefor, can be substituted for a resistor. U.S. Patent No. 5,936,599 to Reymond shows such substitution. **Dr. Mark R. Allen Decl. ¶ 37.**

Applicant challenged the assumptions that stem from traditional LED circuit theory mentioned above, including the assumption that an impedance element is required to stabilize an LED circuit driven by AC power, to arrive at the claimed invention. Knowing that LED performance specifications are provided under DC operating conditions, Applicant discovered that the DC specifications can not be used to gauge the performance of LEDs *under stable AC operating conditions* because of the nonlinear current-versus-voltage characteristic of diodes. With AC input, the LEDs are off over half the time while the voltage is below some positive threshold value (reverse bias). Then, as the voltage increases beyond RMS to peak value and falls back again, diode current varies accordingly in a nonlinear fashion. Applicant discovered that, for AC power, the average (RMS) LED current is much larger than that which would be obtained if the LED were powered by a DC waveform whose voltage is equal to the average (RMS) voltage of the AC waveform. In other words, if the *DC specified* LED voltages are used

to match the AC source voltage in the LED circuit, the resulting LED current will be much larger than desired, and the circuit will be unstable and fail. The experiments performed by Applicant and described above fully support this theory. **Dr. Mark R. Allen Decl. ¶ 38.**

To arrive at the claimed invention, Applicant measured LED current at varying *AC voltages* for a particular LED to create an *AC operating curve* (i.e. I-V characteristic curve) for the LED. The graph below is an example of a *DC operating curve* for a 2-volt DC LED (typically provided by the manufacturer) and the corresponding *AC operating curve* for the same LED:

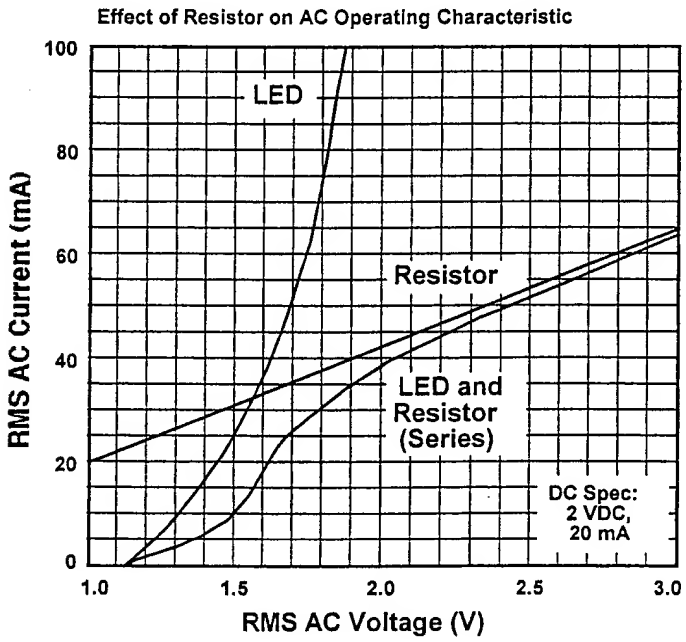


As you can see from the graph, 2-volts on the horizontal axis does not cross the AC operating curve below 100mA, which is known to be the typical maximum operating current (Imax) of an LED. This observation is significant and explains the failures in the experiments performed above. That is, the current produced by matching fifty-five (55) 2-volt DC LEDs to a 110 VAC source exceeds the maximum operating current of the 55 LEDs, thereby causing the LEDs to fail. **Dr. Mark R. Allen Decl. ¶ 39.**

According to Applicant's invention, the AC voltage of the LEDs are matched to the AC source. Thus, the current produced by the LEDs falls within a range that is acceptable and stable.

For example, from the curve, any value of current between the turn-on voltage (or threshold voltage) of the LED and the maximum voltage (or voltage at which the LED fails) can be selected as the *AC operating current* and the corresponding *AC operating voltage* of the LED can be read. If the AC source voltage of an LED circuit is 110VAC, fifty-five (55) 2-volt *AC* LEDs can be connected in series to the source and be stable. **Dr. Mark R. Allen Decl. ¶ 40.**

The effect of a resistor on this AC operating curve is shown below:



Applicant created this curve to show how the resistor linearizes the AC current-versus-voltage characteristic curve of an LED. However, Applicant discovered that the resistor could be eliminated by reading the AC curve *directly* and selecting an operating voltage at a stable point on the AC curve. For example, according to the example provided, a 2-volt DC LED is stable at 1.6 VAC. Thus, an LED circuit powered by a 110 VAC source would be stable if it comprised 69 of these 1.6 VAC LEDs. **Dr. Mark R. Allen Decl. ¶ 41.**

Applicant submits this theoretical explanation to assist the Examiner in understanding the claimed distinctions over the prior art. However, Applicant respectfully notes that the specification did not and *need not* disclose the scientific theory explaining how the invention achieves its aim. *See e.g.* Diamond Rubber Co. v. Consolidated Rubber Tire Co., 220 U.S. 428

(1911); In re Newman, 782 F.2d 971, 974, 228 U.S.P.Q. 450, 452 (Fed. Cir. 1986) ("The PTO is not the guarantor of scientific theory and . . . it is not the province of the PTO to ascertain the scientific explanation"). The Applicant must disclose only the structure of the product to support claims directed to the product and has adequately done so in the specification and figures. To supplement this written theoretical explanation, the inventor Dr. Mark R. Allen submits via Declaration, a brief videotaped presentation detailing the theoretical distinction between *AC characterized* and *DC characterized* LEDs. **Dr. Mark R. Allen Decl. ¶ 42, Ex. H.** Applicant respectfully urges the Examiner to view this brief presentation.

D. Twice Amended Claim 1 is Fully Supported by the Specification

Claim 1, as twice amended, recites a light string comprising:

a predetermined number of light emitting diodes "LEDs" electrically coupled in series to form at least one series block, each LED having an average alternating current drive voltage, the series block having a first LED and a last LED, the first LED directly coupled intermediate a source end and a terminal end of a first of a pair of wires and the last LED directly coupled intermediate the source end and terminal end of a second of the pair of wires, the light string being free from additional circuitry intermediate the first LED and the source end of the first pair of wires, between each of the LEDs; and intermediate the last LED and the source end of the second pair of wires, and

a first connector coupled to both the source end of the first of the pair of wires and the source end of the second of the pair of wires which connector facilitates a direct connection between the first LED and a first side of an alternating current electrical power supply, and the last LED and a second side of the alternating current electrical power supply, the supply [is adapted for direct electrical connection to an alternating current electrical power supply] having a supply voltage, the predetermined number of LEDs substantially calculated by dividing the supply voltage by the average alternating current drive voltage.

The amendments to claim 1 are fully supported by the specification, as amended. The first amended section of claim 1: "each LED having an average alternating current drive

voltage", is supported, for example, at page 5, line 6-8 and 13-15, which, as amended for clarification, states:

> With the average LED drive voltage assumed to be approximately 2.2VAC in Fig. 1, the basic series block size for the top block diagram, corresponding to 110VAC input, is approximately 50 LEDs. . . .
>
> With again the average LED drive voltage assumed to be approximately 2.2VAC in Fig. 1, the basic series block size for the bottom block diagram, corresponding to 220VAC input, is approximately 100 LEDs.

The second amended section of claim 1: "the light string being free from additional circuitry intermediate the first LED and the source end of the first pair of wires, between each of the LEDs, or intermediate the last LED and the source end of the second pair of wires" is supported, for example, by Figures 1 and 2, and at page 4, lines 15-17 of the specification, which state:

> The LED light string may have reduced cost of manufacture by employing series-parallel blocks to allow operation directly from a standard household 110VAC or 220VAC source, [] without any additional circuitry (AC drive) . . ..

The third amended section of claim 1:"which connector facilitates a direct connection between the first LED and a first side of an alternating current electrical power supply, and the last LED and a second side of the alternating current electrical power supply," is supported, for example, by Figures 1 and 2.

The fourth amended section of claim 1: "the supply having a supply voltage, the predetermined number of LEDs substantially calculated by dividing the supply voltage by the average alternating current drive voltage" is supported, for example, beginning on page 3, line 24 of the specification, as amended:

> The series block size is determined by the ratio of the standard input voltage (e.g., either 110VAC or 220VAC) to the drive voltage(s) of the LEDs to be employed (e.g. 2VAC).

E. Claim 1, As Twice Amended, is Not Anticipated By or Rendered Obvious in view of Yamuro ('626)

Paragraphs 2 and 7 of the Office Action set forth the Examiner's basis for rejecting Claims 1-3, 9, 14-16 and 25 as anticipated by, or in the alternative, obvious in view of Yamuro.

1. Yamuro does not Anticipate Applicant's Invention

First, in support of the 102(e) rejection, the Examiner states in paragraph 2 of the Office Action that Yamuro discloses in Figure 1B an LED circuit having a resistor electrically connected between an LED and an alternating current power supply and that "[e]ven though this figure shows one end of the diode block tied to the source via the resistor, by its natural layout, it fulfills Applicant's definition of having this block directly tied to the source."

Applicant respectfully submits, without prejudice, that the basis for the § 102(e) rejection is now moot in view of the amendments to Claim 1. In particular, twice amended claim 1, in addition to reciting a series block directly tied to the source, also recites a light string "*free from* additional circuitry intermediate the first LED and the source end of the first pair of wires, between each of the LEDs, and intermediate the last LED and the source end of the second pair of wires." As the learned Examiner is well aware, for a reference to anticipate under §102(e) it must meet **every element** of the claimed invention. The Examiner frankly acknowledges that Yamuro shows a resistor. Thus, Applicant respectfully submits that Yamuro does not show a light string *free from* additional circuitry intermediate the first LED and the source end of the first pair of wires, between each of the LEDs, and intermediate the last LED and the source end of the second pair of wires, as recited in claim 1.

Second, to further support the § 102(e) rejection, the Examiner states in paragraph 7 of the Office Action that, "[d]espite the fact that Yamuro went on detailing the analysis of a circuit shown in figure 1B, the teaching supported by line 37, column 3 clearly suggests the removal of the resistor (8)." The Examiner goes on to state that "if one were to construct figure 1B in Japan, a resistor (8) would have been inherently eliminated." As a preliminary matter, if a reference "suggests" the absence of an element or that an element would be "inherently eliminated," a rejection under § 102(e) is not proper and should be withdrawn. Notwithstanding, in view of Applicant's arguments in its Response to Final Office Action dated June 8, 2000, and

in further view of the compelling experimental evidence (submitted herewith) that the Yamuro circuit, *without a resistor*, is unstable and fails, Yamuro cannot reasonably be understood to disclose an option wherein the resistor is removed. Furthermore, it is noteworthy to reemphasize that Applicant's interpretation of Yamuro is consistent with other prior art of record, not relied upon with respect to claim 1, which all teach away from Applicant's invention. The pertinent portions of these references were reviewed during the interview and submitted with an IDS along with the response to the first Office Action.

The prior art exemplifies that current limiting circuitry, such as a resistor, inductor or capacitor, was thought to be required prior to the Applicant's invention: Reymond (U.S. Pat. No. 5,936, 599) at col. 2, ll. 50-52 states that "a current limiting resistor 28 (a generating resistor) *must be* connected", and at line 57 that "the resistor is the *dominant* factor in determining the LED current." Page 3 of states that "An LED . . . ***requires*** some kind of current limiting". Pages 210 and 211 of Light Emitting Diodes--An Introduction, states that "some means for current limitation ***has to be*** provided". Pages 215 and 216 of Luminescence and the Light Emitting Diode states that "they [LEDs] ***need*** a series resistance to limit the current." Pages 2.18 and 2.19 of Hewlett Packard's Optoelectronics Manual, show that one of ordinary skill in the art would think that Applicant's invention was *not* obvious since removal of current limiting circuitry is taught to harm the LED lamp. Furthermore, leading LED manufacturers throughout the world, such as Everlight, Super Bright Industrial, Ltd., Yiow Chie Industrial Co., Ltd. and Lite-On Electronics, Inc., teach that a resistor *must* be put in series with a power source to (1) protect the LED and (2) provide a stable circuit. **Dr. Mark R. Allen Decl. ¶ 5-9, Exs. B, C, D, and E.**

Applicant's representative appreciates Examiner Vo's frank acknowledgment during the interview on May 24, 2000 that all of the specifications that she has reviewed for LED's require some form of current limiting circuitry.[3] This acknowledgment is consistent with the teachings of the prior art noted above and should clear up any ambiguity with respect to the teachings of Yamuro. Accordingly, the § 102(e) rejection should be withdrawn.

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[3] Applicant's representative, Mr. McKinley, carefully restated Examiner Vo's comment during the interview to Supervisor Wong to confirm the Examiner's statement.

2. Applicant's Invention was Not an Obvious Variation in Design Choice over Yamuro

Alternatively, the Examiner contends that the claimed invention is an obvious variation in design choice over Yamuro "in view of the fact that line 37, column 3 clearly lays out a desire for doing away with the resistor connection if needed".[4] However, the Examiner states in paragraph 2 of the Office Action that "figure 1B shows the usage of a resistor *to stabilize the operation of the system.*" Applicant agrees with the Examiner that the resistor is required to stabilize the circuit, and respectfully submits that one of ordinary skill in the art would not choose to remove the resistor, thereby creating an unstable or, more accurately, an inoperable circuit.

It is well settled that the legal conclusion of obviousness must depend upon the four factual inquiries identified by Graham v. John Deere Co, 383 U.S. 1, 148 U.S.P.Q. 459 (1966). Those inquiries concern:

1) the scope and content of the prior art;

2) the level of ordinary skill in the art;

3) the differences between the claimed invention and the prior art; and

4) secondary considerations of nonobviousness.

The necessity of a Graham analysis is especially important in cases, such as this one, where the invention is less technologically complex. As the Federal Circuit explained in Ruiz v. A.B. Chance Co., 57 U.S.P.Q.2d 1161 (Fed. Cir. 2000), when an invention is less technologically complex, the danger increases that "the very ease with which the invention can be understood may prompt one to 'fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against the teacher'." Ruiz, quoting In re Dembiczak, 175 F.3d 994, 50 U.S.P.Q. 2d 1614(Fed. Cir. 1999).

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[4] The complete statement encompassing line 37, column 3 states:
> Since the required power source of 100V is equal to the common source voltage in Japan, the resistance **8** apparently seems unnecessary. However, it is proved from experience that the apparatus is stable in function by providing the resistance **8**.

Applicant has shown through experimental evidence that not only is the Yamuro circuit unstable if the resistor is omitted, but the circuit *fails,* and in some instances, virtually blows up. Furthermore, Applicant has requested and failed to receive any evidence from the Examiner to support the assertion that the circuit shown in figure 1B of Yamuro would work without the resistor. Accordingly, it would not be obvious for one of ordinary skill in the art to *choose* to remove the resistor if the resulting circuit would be unstable or fail; especially in view of the scope and content of the prior art which mandates the use of a resistor. In fact, eliminating the resistor would not be a "design choice" as suggested by the Examiner, but would be a ridiculous concept in the context of what the Applicant has submitted *is* the prior art and has demonstrated *will happen* if the resistor is removed. Applicant asks the Examiner to query why anyone would, as a "design choice", eliminate a resistor that is admittedly *known* to stabilize the operation of the circuit? The Examiner's assertion that removing the resistor is an "obvious variation in design choice" is improper hindsight reconstruction and completely ignores the teachings of the prior art, which were provided of record and are cited herein above by Applicant.

It is axiomatic that, in order to make out a rejection under §103, an examiner must show that the suggestion to make the claimed invention is found within the four corners of the cited references. Moreover, it is impermissible within the framework of §103 to pick and choose from any one reference only so much as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of skill in the art. Friction Div. Products, Inc. v. E.I. DuPont de Nemours & Co., Inc., 8 U.S.P.Q.2d 1652, 1664 (D.Del 1988), *citing* In re Wesslau, 353 F.2d 238, 241, 147 U.S.P.Q. 381, 393 (C.C.P.A. 1965). Clearly, nothing in the art leads the artisan of ordinary skill to the present invention, and the Examiner has not made out a prima facie case of obviousness. To the contrary, the art serves to point up the nonobviousness of the present invention. The art is so deficient that the examiner is forced to resort to rejections based on incantations of "design choice" to supply what clearly just isn't there. "Design choice" cannot be resorted to in order to supply teachings found only in the Applicant's own invention.

Applicant also strongly disagrees with the Examiner's contention that "line 37, column 3 of Yamuro clearly lays out a desire for doing away with the resistor connection if needed." This statement is, first of all, not supported by Yamuro, and, more to the point, cannot be true. First,

the Examiner's attention is once again directed to the experimental results provided above for the Yamuro circuit without the resistor; the circuit simply does not work. Second, one of ordinary skill in the art would not interpret Yamuro to teach a desire to do away with the resistor.

Attached as Exhibit F to the Declaration of Dr. Mark R. Allen is a letter from Mr. Duane J. Knize, Chief Scientist for the Technology Research Group at Science Applications International Corporation (SAIC). Mr. Knize has over 27 years of engineering experience including circuit and electronic system design and development. In the second paragraph of his letter, Mr. Knize states that "the discussion in column 3 lines 30-40 clearly promulgates a requirement for this resistor" and later in the letter that "it seems clear to me that the author of patent 5,941,626 considered the resistor to be an essential part of his invention." **Dr. Mark R. Allen Decl. ¶ 11, Ex. F.**

Also, two authors and editors of a number of technical journals, including s former editor-in-chief of the *AT&T Technical Journal* for Bell Laboratories, have concluded that lines 30-40 of Yamuro, read *together* clearly teach that a resistor is required. **Dr. Mark R. Allen Decl. ¶ 12, Ex. G.** The statement in lines 30-33 that "the resistance 8 apparently seems unnecessary" is qualified by and immediately disproved by the statement in lines 34-37 that "[h]owever, it is proved from experience that the apparatus is stable in function by providing the resistance 8. Therefore, the resistance 8 is connected to the circuit shown in FIGS. 1A and 1B".

The Yamuro light string serves to emit light approximately equal in brightness in all directions except backward from the bases of the lamps. (See col 1, lines 8-9 of Yamuro). To remove the resistor would render the Yamuro light string useless for its intended purpose. It is well-settled that a modification which renders the device of the reference unable to perform its intended function teaches away from the suggested modification and, thus, cannot support an obviousness rejection:

> A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant . . . *[or] if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant.* [emphasis added].

In re Gurley, 27 F.3d 551, 553, 31 U.S.P.Q.2d 1130, 1131 (Fed. Cir. 1994). If the suggested teachings of a reference "would produce a seemingly inoperative device," then it teaches away from the suggested modification. In re Sponnoble, 405 F.2d 578, 587, 160 U.S.P.Q. 237, 244 (C.C.P.A. 1969); *see also* In re Gordon, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984) (finding no suggestion to modify a prior art device where the modification would render the device inoperable for its intended purpose). Accordingly, Yamuro teaches away from Applicant's invention.

Even assuming, *arguendo*, that one skilled in the art would even think of modifying Yamuro in view of the prior art teachings (such as Reymond, Hewlett Packard and others noted above), one would still not arrive at the present invention. First, one would have to find some reason for removing the resistor. There is no teaching in the art to do that, and in fact such a change would be *opposite* to what *all* the prior art teaches. Next, one would have to decide to "alleviate this resistor" and, at the same time, decide to ignore the art's teaching that it is required to stabilize the circuit. There is no teaching anywhere to do that, either.

As noted above, all of the prior art of record teaches away from Applicant's invention. To ignore the strength of prior art *teaching away from* omitting current limiting circuitry would be a critical omission in the obviousness analysis. *See* Ecolochem, Inc. v. Southern California Edison, 56 U.S.P.Q. 2d 1065, 1075 (Fed. Cir. 2000).

3. Secondary Consideration of Non-Obviousness

Affidavits or declarations containing evidence of criticality or unexpected results, **commercial success, long-felt but unsolved needs, copying**, failure of others, skepticism of experts, etc., must be considered by the examiner in determining the issue of obviousness of claims for patentability under 35 U.S.C. 103. MPEP § 716.01(a); see also Ruiz v. A.B. Chance Co.,57 U.S.P.Q.2d 1161 (Fed. Cir. 2000). The Court of Appeals for the Federal Circuit stated in Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 1538, 218 U.S.P.Q. 871, 879 (Fed. Cir. 1983) that "evidence rising out of the so-called `secondary considerations' must always when present be considered en route to a determination of obviousness."

(A) – Evidence of Copying of Applicant's Invention

The Examiner states in the last sentence of paragraph 2 of the Office Action that "applying the design without the resistor as suggested in massive production environment, this would mount up to a considerable saving in the production line." We appreciate the Examiner's frank acknowledgment that removal of the resistor provides a considerable commercial benefit to those in the market of selling LED light strings. **To that end, it is noteworthy that no one in the industry has taken advantage of this commercial benefit until *after* Applicant disclosed his invention. David R. Allen Decl. ¶ 15.** By copying Applicant's invention, others in the industry have been able to enjoy the admitted commercial benefit previously only enjoyed by Applicant. Such copying is strong evidence of nonobviousness. *See* General Monitors, Inc. v. Mine Safety Appliances Co., 211 U.S.P.Q. 1126, 1140 (C.D. Cal. 1981) *citing* Photo Electronics v. England, 581 F.2d 772, 781-782, 199 USPQ 710, 719-720 (9th Cir. 1978); Otto v. Koppers Co., 246 F.2d 789, 800, 114 USPQ 188, 197- 198 (4th Cir. 1957), *cert. denied*, 355 U.S. 939, 116 USPQ 602 (1958); Union Carbide Corp. v. Filtrol Corp., 170 USPQ 482, 518 (C.D. Cal. 1971), *aff'd.*, 179 USPQ 209 (9th Cir. 1973); Reeves Instruments Corp. v. Beckman Instruments, Inc., 161 USPQ 450, 480 (C.D. Cal. 1968), *aff'd.*, 444 F.2d 263, 170 USPQ 74 (9th Cir. 1971), *cert. denied*, 404 U.S. 951, 171 USPQ 641 (1971).

Objective evidence such as commercial success, **copying by others**, and skepticism of experts are relevant to the issue of obviousness and **must be considered** in every case in which they are present. MPEP 2141. When evidence of any of these secondary considerations is submitted, the examiner **must** evaluate the evidence. The weight to be accorded to the evidence depends on the individual factual circumstances of each case. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 218 U.S.P.Q. 871 (Fed. Cir. 1983); Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 231 U.S.P.Q. 81 (Fed. Cir. 1986), *cert. denied*, 480 U.S. 947 (1987).

Applicant is aware of a number of instances of copying of the invention that support a finding of non-obviousness. **See, generally David R. Allen Decl. ¶ 14-22.** For example, after Applicant filed for patent protection in the United States, Mr. David R. Allen, President of Fiber Optic Designs (the assignee of this patent application), met with a Taiwan LED manufacturer February 1999 and disclosed Applicant's invention. Attending this meeting was a business

associate of Mr. Joseph Huang of Kampiun Enterprise Co. Mr. Allen then visited Taiwan from April 28, 1999 through May 5, 1999 to meet with light string manufacturers and teach them how to build LED light strings according to the invention. The prototype was demonstrated and detailed assembly instructions were provided. This new and innovative approach to the design of LED light strings was well received.[5] In fact, the Vice General Manager of one of the largest LED manufacturers in Taiwan (LedTech Electronics Corp.) commented that it is *impossible* to build a light string without the current limiting circuitry. **David R. Allen Decl. ¶ 18.**

On April 29, 1999, Mr. Allen met with Mr. Huang who represents a number of light string manufacturers in Taiwan. Mr. Allen educated Mr Huang on how to manufacture stable LED light strings free from additional circuitry, such as a resistor or other power conditioning circuitry, according to Applicant's invention. A prototype of Applicant's invention was also provided.

About one year after this disclosure, Mr. Allen learned that Mr. Huang, acting as a sales agent for an LED light string manufacturer (Excellence Optoelectronics Inc.), planned to release a "new design of LED lite set" at an electronic show in Taipei from October 9-12, 2000. **David R. Allen Decl. ¶ 20, Ex. C.** Excellence Optoelectronics, Inc had manufactured low-voltage LED light strings with power conditioning circuitry (i.e. built-in transformers) for 3 years prior to its announcement of the "new design". Mr. Allen received a set of the alleged "newly designed" LED light strings from the Taipei show. Dr. Mark R. Allen examined the light set and found it to be identical to Applicant's invention and built according to the teachings Mr. Allen revealed earlier to Mr. Huang in Taiwan. **Dr. Mark R. Allen Decl. ¶ 43.** Mr. Allen also learned that prior to the show, in July 2000, Kampiun sold General Electric Corp. 10,000 sets of the "new design LED lite set". **David R. Allen Decl. ¶ 20, Ex. D.**

Applicant also notes that subsequent to the disclosure of Applicant's invention, numerous other companies began to produce and market the identical product, causing great harm to Fiber

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[5]Prior to Mr. Allen's visit, LED light strings built according to the invention did not exist in the marketplace. The only LED light strings that existed required a transformer, which reduced brightness and prohibited outdoor use. **David R. Allen Decl. ¶ 4, Ex. A** (letter from President of International Marketing Corp.).

Optic Designs' ability to compete in the marketplace. Accordingly, Applicant respectfully requests careful consideration of this evidence of copying and respectfully requests withdrawal of the §103 rejection.

(B). – The Commercial Success of Applicant's Invention over a 2-Month Period is Strong Evidence of Non-Obviousness and Cannot be Ignored

Applicant has received an incredibly large number of orders for the product from a number of well-recognized department stores, hardware stores, and toy stores. For example, Applicant has received the following purchase orders for LED light strings to be manufactured according to Applicant's claimed invention, which equates to approximately **$1.5 million** in sales:

1)	Sear's purchase order received	-- 130,000 sets
2)	Boscov's purchase order received	-- 18,312 sets
3)	Target purchase order received	-- 12,504 sets
4)	American Sales purchase order received	-- 9,000 sets
5)	LB International purchase orders received	-- 55,492 sets
6)	Tru Serve Hardware purchase order received	-- 10,392 sets
7)	Menard Home Centers purchase order received	-- 12,504 sets
8)	Thirty-six (36) additional customers placed orders that are not included in this list.	

Applicant received all of these purchase orders **within only 2-months** following approval by Underwriters Laboratory.[6] **David R. Allen Decl. ¶ 12.**

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[6]UL tested this product as a "new and unusual" product. UL polled its offices worldwide and concluded that none of its employees had ever tested a product similar to the invention. **David R. Allen Decl. ¶ 12.**

There can be no doubt as to the tremendous commercial success and interest garnered by Applicant's invention. This evidence cannot be ignored. J.T. Eaton & Co. v. Atlantic Paste & Glue Co., 106 F.3d 1563, 1566, 1572, 41 USPQ2d 1641, 1643 , 1648 (Fed. Cir. 1997) (affirming a finding that "sales evidence . . . shows [strong commercial] success," where the "sales evidence" consisted solely of the patentee's "$17 million of sales from 1979 through 1984, and its $4 million of annual sales from 1985 through 1989"). Moreover, Applicant's potential commercial success is being undermined by companies who have copied Applicant's invention and entered into the market to compete with Applicant. Accordingly, Applicant respectfully requests careful consideration of this evidence of commercial success and respectfully requests withdrawal of the §103 rejection.

(C). --Applicant's Invention has Created Substantial Commercial Interest By Resolving a Long Felt But Unsolved Need to Use LED Light Strings Outdoors

The only LED light strings that existed prior to Applicant's Invention required a transformer or other power conditioning circuitry, which reduced brightness and prohibited outdoor use. **David R. Allen Decl. ¶ 4, Ex. A.** Applicant's ability to provide outdoor LED light strings has solved a long felt need for permanent outdoor LED lighting and has drawn attention from some of the most prominent companies in the world. For example, the engineering division of the *Walt Disney Company* sent an email to the assignee of the Applicant's invention on February 2, 2000, stating "I am very interested in the concept of LED Christmas lights for permanent outdoor installations." *Disneyland's Resort Enhancement* division also emailed Mr. Allen stating they are "very interested" in learning more about Applicant's LED light strings. Applicant's assignee also welcomed strong interest by the Marine Division of the *3M Corporation*. 3M is interested in using Applicant's LED light strings on cruise ships. **David R. Allen Decl. ¶ 5.** Industries such as theme parks and cruise lines are intrigued by Applicant's invention because it provides stable, safe, and bright LED light strings that can be used for extended periods of time in permanent outdoor installations with little or no maintenance required.

Distributors in the consumer market for LED light strings have also been attracted to Applicant's invention due to the ability to safely use the invention outdoors. During the interview with the Examiner on May 24, 2000, Applicant submitted compelling evidence of commercial interest in Applicant's invention. The evidence was formally submitted as Exhibit A to Applicant's Response to Final Office Action dated June 8, 2000, and is being resubmitted as **David R. Allen Decl. Ex. B**. The evidence includes an article from Hardware & Home Centre Magazine dated July/August 1999, the March 20, 2000 edition of HFN, which is a weekly newspaper of home products retailing, and Selling Christmas Decorations 2000, which is targeted to distributors of Christmas decorations. All of these articles demonstrate the substantial interest Applicant's invention has created upon introduction of its LED light strings to the marketplace. Also, as shown in the attachment to the Selling Christmas Decorations 2000 article, the product has generated 33 inquiries from *distributors* of Christmas decorations, which accounts for a significant share of the Christmas decoration market.

Applicant's invention solves the long felt yet unresolved need for outdoor LED light strings. Interest by the *Walt Disney Corporation* and *3M Company* accentuate the non-obvious nature of Applicant's Invention. Thus, Applicant respectfully requests careful consideration of this evidence and respectfully requests withdrawal of the §103 rejection.

4. Summary of Applicant's Response to the §102 and §103 Rejections of Claims 1-3, 9, 14-16 and 25 based on Yamuro

To summarize, Applicant's invention is not anticipated by Yamuro because Yamuro fails to disclose a light string free from additional circuitry between the first LED and the AC source and the last LED and the AC source. The experimental results and theory behind Applicant's invention bear out that Yamuro cannot be read to disclose the absence of a resistor. Applicant respectfully requests reconsideration and withdrawal of the §102 rejection.

Applicant's invention is also not obvious in view of Yamuro. Any reliance on teachings of the prior art would support a finding of non-obviousness of the Applicant's invention. After thorough search and careful study of the art, Applicant, although not his burden, has failed to identify a single source that discloses, teaches, or suggests removing current limiting circuitry in an LED light string by deriving an LED average AC drive voltage and dividing the AC source voltage by the LED average AC drive voltage to calculate the number of LEDs necessary to

provide a stable LED light string, as recited in claim 1. To the contrary, all the references on this record teach that current limiting is required, which is consistent with the teachings of Yamuro and the experimental evidence provided herein. One of skill in the art would not think to alleviate this resistor in view of these teachings because, to do so, would render the Yamuro light string useless for its intended purpose. Moreover, there is no teaching or suggestion to modify Yamuro to arrive at Applicant's invention.

Applicant has also presented strong evidence of secondary considerations of non-obviousness. This evidence cannot be ignored. Applicant has solved a long felt but unresolved need in the art for outdoor LED light strings; that is, the need for stable outdoor LED lighting, powered by an AC source without current limiting circuitry. As a result, Applicant has enjoyed substantial commercial success despite the widespread copying of the invention.

For the foregoing reasons, Applicant respectfully requests that the Examiner provide proof to the contrary, or withdraw the §103 rejections.

F. Claims 11, 12, 17 and 18 are Not Obvious in view of Yamuro ('626)

Paragraph 4 of the Office Action sets forth the Examiner's basis for rejecting Claims 11, 12, 17 and 18 as obvious in view of Yamuro. These claims depend from amended claim 1. Thus, since Applicant submits that amended claim 1 is not obvious in view of Yamuro, claims 11, 12, 17 and 18 which depend therefrom are also not obvious in view of Yamuro. Applicant respectfully requests reconsideration and withdrawal of these rejections.

G. Yamuro (U.S. Patent No. 5,155,669) (not made of record) also Does Not Render Applicant's Invention Obvious

The Patent Office has informally brought to the Applicant's attention Yamuro's '669 patent. Although Applicant recognizes that it is not typical to respond to un-cited references, Applicant respectfully addresses this reference pro-actively to avoid another Office Action citing this reference. Applicant submits that the '669 patent, which was granted *prior to* Yamuro's '626 patent, uses a DC source to power the LEDs, with resistance provided internally from the battery. Neither the battery nor its resistance is shown in the '669 patent. Thus, without the disclosed optional "protection diode," the drawn terminus of the DC battery circuit appears to be

equivalent to the drawn terminus of Applicant's AC circuit. However, the '669 patent never considers AC circuitry. The symbols used for the power source are classic DC power symbols.

Furthermore, the light emitting apparatus of the '669 patent serves as an electronic ornament or display, outside or inside a building (See col 1, lines 8-9). The circuit operates on low voltage and is powered by a DC cell. (See col 3, lines 58-68). The cell may be applied to a moving vehicle or a person. Examples of uses of the light string apparatus include: use on an automobile, a bicycle, a helmet, a working dress of a person working in a dark place at night, or attaching the light string to a persons head, neck, hands, legs or other parts of a person for purposes. (See col. 4, lines 9-25). These are all *portable* uses. Since AC power is not a portable power source, and nothing in the reference discloses, teaches or suggests AC power, Applicant respectfully submits that the '669 patent does not anticipate or render obvious Applicant's invention.

III. 35 U.S.C. §103(a) Rejections Based on a Combination of References

Claims 4, 6-8 and 21-24 were rejected under 35 USC §103(a) as being unpatentable over Yamuro in view of Reymond (U.S. 5,936, 599). Claims 13-28 were rejected under 35 USC §103(a) as being unpatentable over Yamuro in view of Frohardt et al. (U.S. 3,758,771). Claims 19, 20, 26 and 27 were rejected under 35 USC §103(a) as being unpatentable over Yamuro in view Chang et al. (U.S. 5,887,967).

All of the claims rejected under §103 are dependent on Claim1. Applicant submits that claim 1, as amended, is allowable. Therefor, these §103 rejections are moot. Notwithstanding, the Applicant briefly will discuss the §103 rejections below.

A. Claims 4, 6-8 and 11-28 are Not Obvious Since Yamuro teaches away from Applicant's Invention and There is No Stated Motivation to Combine Yamuro with Either Reymond, Frohardt, or Chang

The Yamuro reference is cited alone or in combination with other references as the basis for each of the §103 rejections. As set forth in greater detail above and in Applicant's Response to Final Office Action dated June 8, 2000, Yamuro teaches away from Applicant's invention. Thus, the Yamuro reference alone, or the combination of Yamuro with any of the references would direct one of ordinary skill in the art *away from* Applicant's invention. Accordingly,

Applicant respectfully submits that claims 4, 6-8 and 11-28 are not obvious in view of Yamuro alone, or in combination with the other cited references.

Furthermore, neither Reymond, Frohardt, nor Chang teach or suggest a direct connection between an AC source and an LED, as recited in claim 1. Reymond at col. 2, ll 50-52 states that a resistor is required, and Frohardt and Chang do not discuss it at all. Accordingly, Applicant's invention is patentable over the prior art of Yamuro in view of Reymond and the combination of the references, even if appropriate, could not be construed to teach or suggest Applicant's invention.

Lastly, the Examiner states no motivation to combine Reymond, Frohardt or Chang with Yamuro. The absence of a convincing discussion of the motivation to combine the prior art references, particularly in light of the strength of prior art teaching away from omitting the resistor, is a critical omission in the Examiner's obvious analysis. *See* Ecolochem at 1075. Accordingly, to combine these references with Yamuro without a discussion of the motivation to combine fails to demonstrate how the prior art teaches or suggests the combination claimed in Applicant's invention.

B. The Reymond Reference Does Not Make Up for the Deficiencies of Yamuro to Support the Rejection of Claim 5

The rejection of claim 5 is deemed to be moot in view of amended claim 1 which Applicant submits is now in allowable form. However, assuming *arguendo*, that the rejection is not considered moot, Applicant submits the following distinctions over Reymond:

Claim 5 recites a limitation on the LED in which "each LED has a p-n junction defining a breakdown voltage above which voltage applied in reverse bias said p-n junction breaks down." Reymond at col. 5, lines 1-13 relates to an arrangement of oppositely polarized LEDs wherein each set of LEDs of similar polarity will light during one half-cycle of the AC voltage source. The reference makes note of LED faults but clearly does not disclose, teach or suggest a p-n junction defining a breakdown voltage. Thus, Yamuro in view of Reymond does not teach or suggest the structure recited in claim 5.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the §103 rejection of claims 5.

C. Change Does Not Disclose Teach or Suggest the Mechanical Alignment System Recited in Claims 19, 20, 26 and 27

Claims 19, 20, 26 and 27 were rejected by the Examiner under 35 U.S.C. 103(a) as being unpatentable over Yamuro in view of Chang (U.S. 5, 887,967). Applicant reasserts the arguments set forth above and further addresses the rejections to claims 19, 20, 26 and 27 as follows.

Paragraph 6 of the Office Action recites that "Chang teaches a mounting structure with a keyed offset to ensure proper alignment between a bulb holder and the base of the bulb" and that "to prevent incorrect insertion of the bulbs, one of ordinary skill in the art would have considered it obvious to improve the mounting structure of Yamuro lighting bulbs with Chang's alignment system." Applicant respectfully disagrees that Change teaches a "mounting structure" even remotely similar to Applicant's claimed structure. The socket taught by Chang is drastically different from that of Applicant's invention in that it does not disclose a physical barrier to ensure correct insertion of the LED. Applicant's invention is clearly distinguishable from, and an improvement over, the light bulb assembly disclosed in Chang.

Claim 19, as amended, recites a lamp holder having a keyed offset, the lamp holder fixedly attached to each LED, and a lamp base having *a notch adapted to receive the keyed offset* of the lamp holder. The keyed offset and notch *mechanically* orient and align the LED by its polarity and *physically* prevent improper insertion of the lamp holder into the lamp base. The asymmetrical mechanical design of Applicant's invention structurally prohibits improper insertion of the LED. Chang discloses a light bulb assembly wherein the base and light bulb holder are each provided with a dint for *visual alignment* of the bulb holder into the base. In the brief 15-line description of the invention, Chang teaches a light bulb assembly including:

> a base **2** provided with a dint **21** at one side and the light bulb holder **3** also provided with a dint **31** at one side on its top. The LED bulb **4** is received in the holder **3** with one of the leads **41** aligned with the dint **31**. The holder **3** accompanying with the LED bulb **4** is then engaged within the base **2** in a direction of the dint **31** of the holder **3** matching the dint **21** of the base **2.**

Unlike Applicant's invention, Chang's design does not provide a *mechanical* structure to prevent improper insertion of the LED. According to Chang's design, there is no physical barrier to prevent the improper insertion of the LED. Nothing in the brief disclosure of Chang discloses,

teaches or suggests a mechanical interlock for fail-proof connection of an LED to a power source to insure proper polarity. To the contrary, Applicant's invention is an improvement over Chang since it *completely* prevents incorrect insertion of the LED.

Accordingly, reconsideration and withdrawal of the §103 rejections of claims 19, 20, 26 and 27 is respectfully requested, and allowance of these claims is earnestly solicited.

Coincidentally, a patent on a similar mechanical alignment system was granted to Shu (U.S. Patent 6,109,764) on a U.S. patent application filed *after* Mr. Allen disclosed the invention to a Taiwanese manufacturer in New York one month earlier. The address in Taiwan listed for Shu is on the same street as the Taiwanese manufacturer. In considering whether to maintain this rejection, Applicant asks the Examiner to query how Shu met the requirements for patentability after a search of U.S. Class 362/226, which is the *same class* the Chang reference lists as its U.S. class, while Applicant's structure allegedly does not in view of Chang.

IV. CONCLUSION

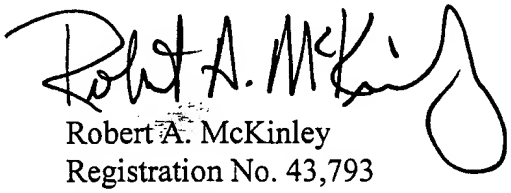
Based on the foregoing, Applicant submits that the light string of claim 1 is not anticipated by Yamuro. Claims 2-9 and 11-28 all depend from claim 1 either directly or via another dependent claim, and are believed to be allowable for the reasons given in connection therewith.

Furthermore, claims 4-8 and 11-28 are not taught nor fairly suggested by the Reymond reference, the Frohardt reference, the Chang reference, or any of the other references cited. Therefore, reconsideration and withdrawal of the §103 rejection of these claims is respectfully requested.

Should the Examiner believe that direct contact with the Applicant's attorney would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the number listed below.

Applicants respectfully submits that the claims as amended are patentable over the cited references. Accordingly, an early Notice of Allowance is earnestly solicited.

Respectfully submitted,



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